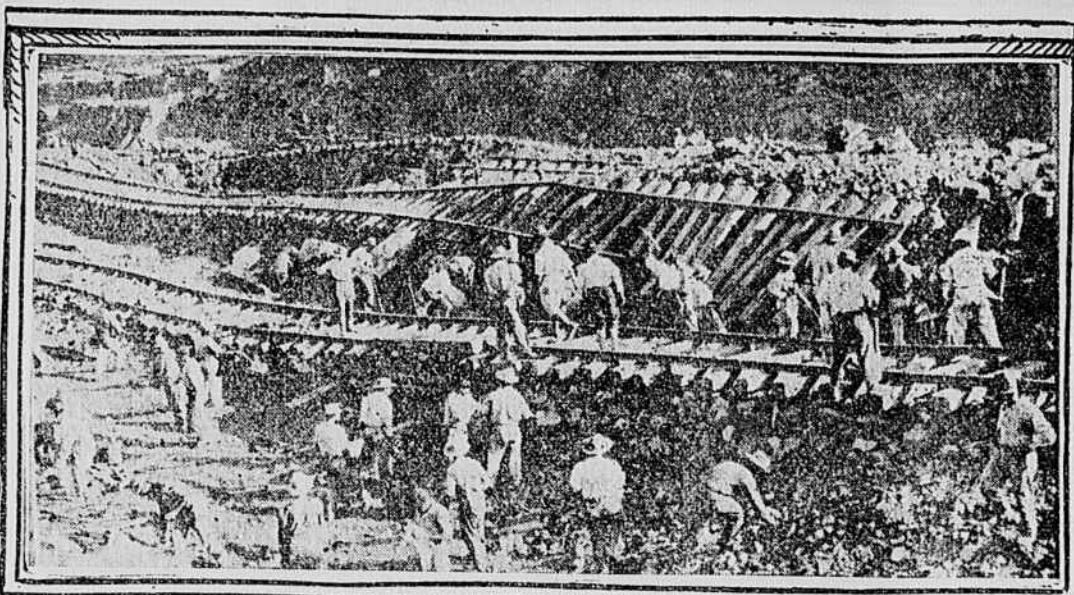


# Uncle Sam's Mighty, Dry Glaciers in the Panama Canal Zone

Culebra, Canal Zone, Panama. I WANT to tell you something about the dry glaciers of the Culebra cut, the mighty masses of earth and rock which are sliding down into the big ditch that Uncle Sam is gouging out of the Andes. It is hard to understand them without being on the ground. But if you will take your foot in your hand and come with Col. David D. Gaillard, the famous engineer who has charge of the Culebra division, we shall go through the cut and look at them with our own eyes. There are plenty in sight even as I write these lines. There are two places nearby where more than 1,000,000 cubic yards of earth and rock are now moving. The material in action is equal to a solid block 300 feet square and 200 feet high. Build it up as a cube and its base would be more than two acres and it would rise to the height of a thirty-story flat. That enormous quantity of rock is advancing at the rate of almost two feet per day and since the beginning of our digging we have had thirteen or fourteen times as much as that mass to take care of. The total has been over 15,000,000 cubic yards, or enough material to make a wall three feet thick and as high as a two-story house reaching all the way from New York to Chicago. It would make four mighty pyramids as big as Gizeh, and all told, considerably more than the excavation we have yet to make. In either case, had there been no slides the excavation for the canal would have been done long ago. As it is we have 15,000,000 cubic yards yet to dig, and of this something like 4,000,000 are the direct result of the slides.

**In the Culebra Cut.** But let us climb down into the Culebra cut. As we stand here on the heights we can see it stretching to the right and the left until the wings of the mountains hide it from view. It is altogether nine miles in length, and about 200 feet deep. In some places the entire back that has been made in account of the slides is almost 2,000 feet wide at the top and the sloping sides are in places to the bottom of the canal, where the width is 200 feet. Looking at the country the edges of the ditch are ragged and hilly. In some places the mountains rise high over it, and in others they slope down and then rise again. It is impossible to conceive the vast amount of earth that has been taken out. The figures convey no idea of the concrete dimensions. I will only say that up to a year ago, we had taken out enough earth and rock to have built a wall 200 feet high, twelve feet thick and long enough to reach from the Capitol to the White House in Washington, or enough to have made six pyramids the size of Cheops and left something to spare. In one month we have taken out enough stuff to fill a ditch three feet wide and three feet deep from Boston to Chicago, and most of that was of such a nature that it had to be blasted. If you should blast out a tunnel over a thousand miles long and so big that a horse could crawl through it you might have some idea of the work Uncle Sam did in that month.

**Dynamiting the Andes.** As we pick our way down into the cut we can see the mighty work everywhere going on. Flying trains of earth are moving this way and that. Scores of steam shovels are puffing and groaning as they drop the earth and rock on the cars, and everywhere are gangs of negroes who are drilling the ledges and putting in dynamite to break up the earth for the shovels. As we start we pass the pipe line which carries the air for the drills. This is ten inches in diameter, and it runs from one end of the cut to the other. It is fed by three air compressors, each of which has a dozen



Second photograph, taken two minutes later. "Right under our eyes we saw the earth rise and throw the railroads, ties and all to one side."



"I investigate a geyser." Mr. Carpenter amid the steaming fumes of Uncle Sam's baby volcano.

furnaces fed by fuel oil, and which are so powerful that they can compress 17,000 cubic feet of air every minute. The air feeds the drills and keeps them chugging away day and night boring the holes for the blast. It drives the augers, each as big around as your leg, down into the heart of the Andes, cutting holes from fifteen to thirty feet deep, in which the dynamite is sunk to tear up the rock.

"Last year," says Colonel Gaillard, "the holes we put down, if joined end to end would have reached 900 miles. They would have equaled a pipe running all the way from Philadelphia to Chicago, or if sunk straight through the earth would have reached almost one-fourth of the way to the center." As we go on I ask Colonel Gaillard something as to the amount of explosives needed on the canal. He replied that the consumption of dynamite for twelve months was over 2,500,000 pounds, and the consumption in one year would more than load five trains of the lumbered cars which carry the earth and rock out of the cut. As though so slowly as to be imperceptible.

I watch them charging the holes. I observe that the dynamite is wrapped in pink paper, and ask Colonel Gaillard the reason. He replies: "That is to keep track of it and prevent the workmen stealing it to dynamite the waters for fishing. Such a charge kills the fish, and they rise to the surface and can be easily caught. The loss from this source was considerable, but this pink paper can be seen a great distance, and now whenever we catch a man with dynamite so wrapped we arrest him."

**How the Earth Slides.** As we make our way down into the cut we can see cracks everywhere. In some places they are so wide that you could put your foot in them, and others are cracks all over the hills, and some of them mark our bodies of earth which will have to be moved, as they are already sliding down into the ditch.

There is one great crack here at Culebra which incloses four acres, comprising a million or more cubic yards which are already moving. As though so slowly as to be imperceptible. Indeed, most of these slides occur at that time, although there are some also in the dry season. I watched one such mass of earth moving today. It comprised about a million cubic yards, equal to a block 300 feet square and 200 feet high, and was going forward at the rate of sixteen inches per day. As I stood in the bed of the canal the place where the clay joined the rock could be plainly seen. It was a sort of a hollow in the hills where the rock of the cut had been blasted off sheer so that one could follow with his eye the line where the clay ended and the bed rock began. There was a ninety-five-ton steam shovel at the foot of the rock, and it was watching the earth as it fell and loading the cars. It was working just fast enough I was told, to keep the stuff from the slide out of the way. I could see the earth fall now slowly and now in great masses, continuously dropping down into the cut.

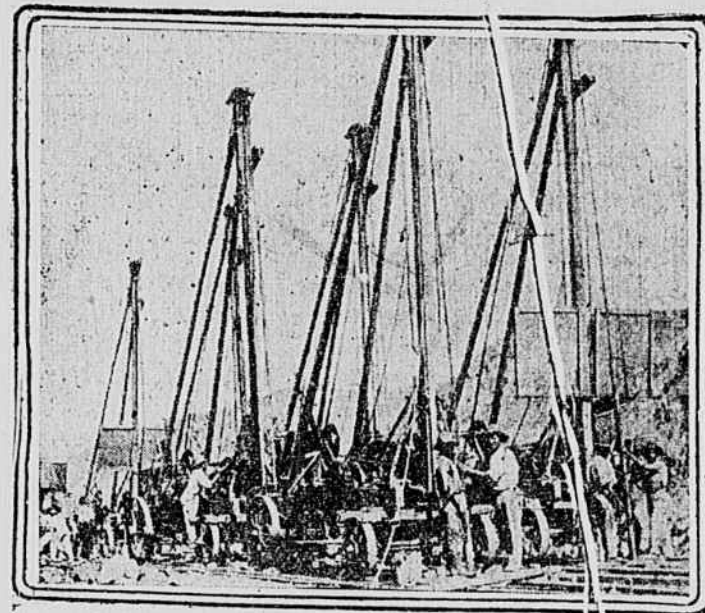
**The Mighty Cockroach.** These surface slides have carried down great masses of material. Take the Cucuracha means "cockroach," and this cockroach is the biggest of its kind upon earth. It covers an area of forty-seven acres and forms a great mass of earth which has broken off 1,820 feet from the center of the canal. It began when the French were still working, and it has caused us trouble ever since we started to dig. We have already moved out of it a mass of earth amounting to 2,000,000 cubic yards, and it is still active. At one time it came onward at the rate of fourteen feet every day. Nevertheless the steam shovels are up as it came, and there is no doubt but that the shovels and dredges will be able to care for it and all the other slides of the future. The ordinary slide can be handled by one shovel, and this is so even when the slide is a long one. At Los Cascados a shovel moved up and down a slide one hundred times raring back and forth and chawing off its toes as they were pushed on into the cut.

There is a big slide on the west side of the cut near Culebra which covers twenty-eight acres and another on the east side north of Gold Hill where about seventeen acres have broken off beginning 1,200 feet back from the center line of the canal. So far an area something like 157 acres of slides has been taken out and there are many acres still in motion. Colonel Gaillard has seen the glaciers of Alaska, tells me that these slides move just like them. The earth flows down the sloping surface of the bed rock, the lateral support of the masses having been removed by the digging. It is just as though the earth were made of molasses and held back by dams at the slides. These dams were taken away by the digging of the canal.

**Squeezing Old Mother Earth.** In addition to these surface slides or motion which is carrying great masses of rock into the canal. These masses do not come from the top, but from the strata of which the canal banks are made. Sometimes they come from below the canal bed and force their way up in humps through it, overturning steam shovels and throwing down the railroad tracks. During my walk through the cut this morning, at a point just opposite Gold Hill, I saw a hump or great hill which had risen up in the bed of the canal during the night, moving the four railroad tracks which ran parallel across it. The rails were twisted and torn, and the ties were pulled



First photograph of elevation of canal bed. Colonel Gaillard and myself stopped to watch the map.



"Gangs of negroes are drilling the ledges."

out of the earth. Colonel Gaillard and myself stopped to watch the men who were getting ready to repair the tracks and were bringing up shovels to take out the hump, when lo, right under our eyes, we saw the earth rise and throw the railroad, ties and all to one side. I had my camera ready and made photographs of the ground while it was moving. I had just finished taking my last picture when one of the tracks fell clear over and rolled down the side of the hill. This hump was right in the bed of the cut and almost on the edge of what will be the permanent bed of the canal.

**Where Rock Moves Like Water.** Shortly after this I went with Col. Gaillard to one side of the canal where the rock was such that the strata could be plainly seen. The walls of the cut contained many different layers of rock of varying degrees of density, lying one upon the other. Here was a stratum of shale, there one of lava and there it one of limestone or a layer of volcanic dust hardened to stone. There were also strata of lignite and other soft rocks.

Now, before we began excavating, as these strata lay one upon the other, the weight of the mass was equally distributed, bed upon bed, so that it was not possible for any of the strata to move, no matter what lay above them. Then the great ditch was cut and the weight and pressure on that side were taken away. This allowed the great weight above to exert its force on the weaker strata beneath, and it has squeezed some of them out into the canal. You may imagine how this could be if you will regard some of the weaker strata as like a thick fluid, say molasses, or the jelly in a layer cake. The layers above will force the molasses out at the sides and if you press on the cake the jelly will come. Now, the lighter strata especially are of this nature. These give way to the weight above and force themselves out into the canal bed, or if the stratum is under the bed of the canal it is squeezed out so that it humps up and throws the railroads as I have described.

**Slides Can Be Controlled.** Slides of strata such as I have described are common, but the engineers know how to control them. They have occurred so often that they are now taken as a matter of course.

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hump I saw to-day will be all out of the way before night. Four hundred men are working at it and sending it down to Balboa.

Colonel Gaillard tells me that there has not been one week during the past three years when the bottom of the canal has not been heaving and rising, but he adds that the heaving grows less and less as the weight from the sides of the cut is removed and the upper banks properly sloped. At present the only place where the earth is so working is right under Gold Hill. The trouble occurs within a length of perhaps 200 feet, where it formerly extended over 2,000 feet. The humps make it necessary to rebuild a great deal of track, and on this account altogether more than 100 miles of track have already been shifted. This is one of the necessities of the work, however, and it will all be remedied when the canal has been properly sloped and the earth is again in equilibrium.

**The Rainfall.** The surface slides will likewise stop as soon as the natural slope of the earth has been reached, although in this account will have to be taken of the immense rainfall, which adds to the weight. The rains here are often exceedingly heavy, retarding the work. During the wet season the clay flows down like a river and it takes time to clear the railroad of mud. As an instance of the rainfall, there are some places on the isthmus where it has spouts as heavy as anywhere in this world. At Porto Bello in December, 1911, two and one-half inches of water fell in three minutes, the rain falling in sheets so thick that one could hardly see his hand before his face. Had it continued at that rate a man standing still on a flat plain inclosed by water-tight walls would have been drowned in two hours, and did the rain last all day at its close the water would be 1.9 feet deep.

Such rains are extraordinary, but for even a short time and the rainfall at Culebra is far less than at Porto Bello. Nevertheless, it is such that it must be reckoned with in connection with slides.

**The Baby Volcanoes of Culebra.** As we make our way through the cut with Col. Gaillard we can see the baby volcanoes which have alarmed the engineers as to the future of the canal. They are not really volcanoes, but are heated areas where the chemical condition of the earth is such that it oxidizes upon exposure to the air and generates heat. In some places the cut goes down into others, the ground is so warm that you cannot put your hand in it.

These hot spots are found at various depths and they are often of such a temperature that dynamite would explode if put in the hole, drilled through them. For this reason a long iron pipe is dropped down into a hole before it is charged. It is left there for ten minutes and then taken out. Now by running the pipe along by the pipe once and whether there is a hot place in the hole as this heats the pipe at that place. Some premature explosions have occurred owing to the lack of this test and I am told that some of the material now being handled would use dynamite if brought near it.

**I Investigate a Geyser.** In going through the cut with Col. Gaillard the other day I climbed the sides of a hill to the place where the stream was pouring forth like a geyser. The water was sulphur and brimstone was strong, and I had to get to windward to prevent being overcome by it. The Colonel warned me also that the gas might be poisonous. I reached down and put my hand in the stream. It was scalding. At that place the ground was yellow with sulphur and the stream was pouring out over an area of several square yards. Col. Gaillard took a mantle envelope and I am told that some of the cracks and the heat was such that it destroyed it. It even charred a piece of white pine lumber, although it did not bring it to a blaze.

In looking at the earth near the steam vents it seemed cold, and I put my hand on the surface. There was no sign of heat, but when I scraped away a bit of the crust I was almost burned by the contact.

In loading this stuff the mass is so hot that the brakemen cannot pile on the cars and they hang outside holding on by the irons as the trains move on toward the dump.

I would say, in closing, that there is no danger from these hot spots. The geologists of the commission have examined them, and they say they are due to the oxidation of pyrites and other materials which generate heat on their exposure to air.

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**BURLINGTON**

(Special to The Times-Dispatch.) Burlington, N. C., June 1.—Miss Irma Joyner, of Baltimore, came Tuesday to be the guest for some time of her sister, Mrs. James H. Holt.

Miss Jessamine Gant is in Leesville, S. C., spending last week here visiting Mr. and Mrs. Edwin Allen Holt, who have been visiting the past month in Detroit, Washington and New York, will return home Monday.

Mrs. James P. Montgomery's class of young women of the Christian Church had a delightful all-day picnic Tuesday near Big Falls.

Misses Gertrude Fleming, of Creedmoor and Etta Washington, of Stem, are here visiting Misses Ruth and Resale Damm, and attending high school commencement.

Cecil Gant, who has been in school at Warrenton, is at home for his vacation.

Rev. J. O. Guthrie, of Raleigh, has purchased the residence of Lynn B. Williamson, on Park Avenue, and moved his family here this week.

Miss Lillie Walters, of Hertford, who has been at the Normal College the past week, spent last week here visiting Rev. and Mrs. T. A. Sike.

Rev. B. L. Hoge, of Richmond, came Monday and began a series of revival meetings at the First Baptist Church Monday night.

The children of young women are at home for their vacation. Misses Cecile Holt, Iris Holt and Etta Garrett, Normal College; Edith Carroll, Salem Female Academy; Imogen Thurston, Greensboro Female College, and Mary Walton, Kings Business College, are here.

Mrs. R. H. Whitehead left Wednesday for an extended visit to several Northern cities. While away she will attend the marriage of her brother, in New York.

Miss Lilla Kibler, who has been teaching at Mylon, spent last week here visiting friends on her way to Lynchburg, to spend some time at Randolph-Macon.

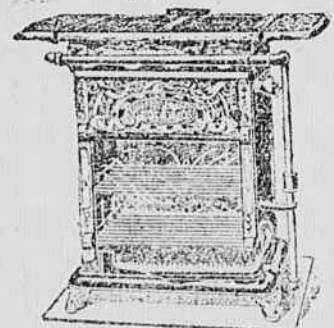
The children of the Methodist Protestant Church gave a trolley ride and evening picnic at Harden Park to the Baraca class Thursday evening. About 200 were present and all had a most delightful time.

Miss Mabel Harney, of Henderson, is here visiting her sister, Mrs. R. M. Anderson.

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